

**STATEMENT**

I, Yoshikazu SAKA of c/o NGB Corporation, Toranomom East Building, 7-13,  
Nishi-Shimbashi 1-chome, Mnato-ku, Tokyo 105-8408, Japan, hereby state that I  
am conversant with both the English and Japanese languages and certify to the  
best of my knowledge and belief that the attached is a true and correct English  
translation of the priority document of Japanese Patent Application  
No.2003-20670.

Date: June 27, 2006

A handwritten signature in black ink, appearing to be "Yoshikazu SAKA", written over a horizontal line.

Yoshikazu SAKA

PATENT OFFICE  
Japanese Government

This is to certify that the annexed is a true copy of  
the following application as filed with this office.

Date of Application: January 29, 2003

Application Number: Japanese Patent Application  
No. 2003-020670

Applicant(s): BRIDGESTONE SPORTS CO., LTD.

February 6, 2004

Commissioner, Yasuo IMAI

Japan Patent Office:

(Seal)

Issuance No. Pat. 2004-3007471

[Name of Document] Patent Application

[Reference Number] P-10950

[Addressed To] Commissioner, Patent Office

[Inventor]

[Address] c/o Bridgestone Sports Co., Ltd.,  
6-22-7, Minamiooi, Shinagawa-ku, Tokyo,

[Name] Masafumi NISHITANI

[Inventor]

[Address] c/o Bridgestone Sports Co., Ltd.,  
20, Ohnohara, Chichibu-shi, Saitama

[Name] Hideo MATSUNAGA

[Applicant for Patent]

[Identification Number] 592014104

[Appellation] BRIDGESTONE SPORTS CO., LTD.

[Agent]

[Identification Number] 100086911

[Attorney]

[Name] Tsuyoshi SHIGENO

[Indication of Fee]

[Registered Number of Prepayment] 004787

[Amount of Payment] 21000

[List of Attached Documents]

[Article]	Specification	1 copy
[Article]	Drawings	1 copy
[Article]	Abstract	1 copy

[Request for Proof] yes

[Name of Document] Specification

[Title of the Invention] Golf Club Head

[Scope of Claims]

[Claim 1] In a hollow golf club head comprising a face  
5 portion, a sole portion, a side portion and a crown portion  
bending upwardly, the golf club head characterized in that the  
golf club head is formed of three bodies, that is:

a front body, which includes a face portion and  
forms a front part of the head;

10 a back body forming a rear part of the head; and  
a middle body disposed between the front body and  
the back body, the middle body extending at least from  
the crown portion to a toe side of the side portion and  
to a heel side of the side portion,

15 and that material of the middle member is lower in longitudinal  
elastic modulus and specific gravity than material of the front  
body and material of the back body.

[Claim 2] The golf club head according to claim 1,  
characterized in that the front body and the back body are made  
20 of titanium or titanium alloy, and that the middle body is made  
of a metal or an alloy having a melting point equal to or lower  
than 700°C.

[Claim 3] The golf club head according to claim 1,  
characterized in that the front body and the back body are made  
25 of titanium or titanium alloy, and that the middle body is made

of carbon fiber reinforced plastic.

[Claim 4] In a hollow golf club head comprising a face portion, a sole portion, a side portion and a crown portion bending upwardly, the golf club head characterized in that the  
5 golf club head is formed of three bodies, that is:

a front body, which includes a face portion and forms a front part of the head;

a back body forming a rear part of the head; and

a middle body disposed between the front body and  
10 the back body, the middle body extending at least from the crown portion to a toe side of the side portion and to a heel side of the side portion,

and that material of the middle body is thinner than those of the front body and the back body.

15 [Claim 5] The golf club head according to claim 4, characterized in that the crown portion of the front body and back body has a thickness in a range of 0.8 mm to 1.2 mm, and that the middle body has a thickness in a range of 0.6 mm to 1.2 mm.

20 [Claim 6] The golf club head according to any one of claims 1 to 5, characterized in that the middle body is present in the crown portion, the sole portion, and the side portion of the golf club head.

[Claim 7] The golf club head according to any one of  
25 claims 1 to 5claim 1, characterized in that the middle body

is present in the crown portion and the side portion of the golf club head.

[Claim 8] The golf club head according to claim 6, characterized in that a ratio of an area of the middle body  
5 to an entire outer surface area of the golf club head is in a range of 8 % to 35 %.

[Claim 9] The golf club head according to claim 7, characterized in that the ratio of the area of the middle body to the entire outer surface area of the golf club head is in  
10 a range of 5 % to 33 %.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to a hollow golf club head,  
15 and particularly relates to a golf club head having a wood type shape or another shape close to the wood type shape.

[0002]

[Conventional Art]

Hollow golf club heads made from metal are used broadly  
20 as wood type golf club heads such as drivers or fairway woods. Generally, as shown in Fig. 3, a wood type hollow golf club head 1 includes a face portion 2 for hitting a ball therewith, a crown portion 3 forming the top portion of the golf club head, a sole portion 4 forming the bottom portion of the golf club  
25 head, a side portion 5 forming the side portion on the toe side,

back side and heel side of the golf club head, and a hosel portion

6. A shaft 7 is inserted into the hosel portion 6 of the golf club head 1, and fixed thereto by an adhesive agent or the like.

Incidentally, recently, many golf club heads called utility

5 golf club heads have appeared on the market. As one kind of utility golf club head, various golf club heads similar to the wood type golf club head (that is, including a face portion, a sole portion, a side portion and a crown portion) are available on the market.

10 [0003]

Aluminum alloys, stainless steel or titanium alloys are available as metal for forming such hollow golf club heads. Of them, titanium alloys have been used broadly in recent years.

[0004]

15 JP-A-2002-119625 discloses a golf club head in which a face portion is made thicker than a crown portion, the crown portion is curved upward, and the face portion and the crown portion are molded integrally by press working.

[0005]

20 JP-A-Hei.7-155410 discloses a golf club head in which the rear half side thereof is made from high-specific-gravity metal such as stainless steel or brass, while the front half side thereof is made from a low-specific-gravity material such as CFRP, titanium, or aluminum.

25 [0006]

JP-A-Hei.7-112041 discloses a golf club head in which a crown portion is made from CFRP, and a sole portion is made from aluminum, while the other head body portion is made from stainless steel, a titanium alloy or a copper alloy.

5 [0007]

[Patent Document 1]

JP-A-2002-119625

[Patent Document 2]

JP-A-Hei.7-155410

10 [Patent Document 3]

JP-A-Hei.7-112041

[0008]

In order to increase the carry of a shot with a metal hollow golf club head, development has been made and aimed at increasing the repulsion of a ball by use of bending of the face surface, to thereby hit the ball farther. However, when a golfer having a low head speed uses such a golf club head, the deformation of the face surface is so small that the effect of increasing the initial velocity of a ball is insufficient. In addition, a low trajectory of the ball may hinder increase of the carry.

[0009]

According to the golf club head disclosed in JP-A-2002-119625, the crown portion is bent upward as soon as a ball is hit, so that the repulsion of the ball is enhanced.



However, in the golf club head disclosed in the same publication, the rear portion of the golf club head is also thin so that the moment of inertia is relatively small.

[0010]

5           In the golf club head disclosed in JP-A-Hei.7-155410, the specific gravity of the head rear portion is so heavy that the head is badly balanced in weight.

[0011]

10           In the golf club head disclosed in JP-A-Hei.7-112041, the side portion is continuously integrated with the head rear portion and the head front portion including the face portion, so that the bending of the crown portion when a ball is hit is not always sufficient.

[0012]

15           It is an object of the invention to provide a golf club head in which the moment of inertia is increased so that the sweet area can be expanded, while the crown portion is sufficiently easy to bend so that the launch angle is increased and the carry can be consequently increased even when a golfer  
20   having a low head speed uses the golf club head.

[0013]

[Means for Solving Problem]

25           In a hollow golf club head comprising a face portion, a sole portion, a side portion and a crown portion bending upwardly, the golf club head of the invention (claim 1) is

characterized in that the golf club head is formed of three bodies, that is a front body, which includes a face portion and forms a front part of the head; a back body forming a rear part of the head; and a middle body disposed between the front  
5 body and the back body, the middle body extending at least from the crown portion to a toe side of the side portion and to a heel side of the side portion, and that material of the middle member is lower in longitudinal elastic modulus and specific gravity than material of the front body and material of the  
10 back body.

[0014]

In the golf club head according to the the invention, at least, the crown portion and the side portions on the toe side and the heel side include the middle body, which is lower  
15 in longitudinal elastic modulus and specific gravity than material of the front body and material of the back body. The middle body is light, and is lower in longitudinal elastic modulus and specific gravity than material of the front body and material of the back body, not only in the crown portion  
20 but also in the side portions on the toe side and the heel side.

[0015]

Thus, the crow portion bends sufficiently at the time of impact so that the launch angle of a ball can be increased. As a result, even when a golfer having a low head speed uses  
25 the golf club head, the launch angle is increased so that the

carry can be increased. In addition, the moment of inertia is so high that the sweet area can be expanded.

[0016]

The front body and the back body may be made of titanium  
5 or titanium alloy, and the middle body may be made of a metal  
or an alloy having a melting point equal to or lower than 700°C.  
When the front body and the back body are disposed in a mold  
and metal or alloy liquid at 700°C or lower is then charged  
between the front body and the back body, the golf club head  
10 including the middle body can be formed easily.

[0017]

Also, the front body and the back body may be made of  
titanium or titanium alloy, and the middle body may be made  
of carbon fiber reinforced plastic. This is golf club head  
15 including the middle body can be formed easily as follows. That  
is, the front body and the back body are disposed in a mold,  
and prepreg as a raw material of the middle body is then disposed  
between the front body and the back body. The prepreg is expanded  
by air pressure so as to be brought into close contact with  
20 the inner surface of the mold while being made continuous to  
the front body and the back body. Thus, the golf club head  
including the middle body can be formed easily. The specific  
gravity of the solidified prepreg is so small to be 1.4-1.7  
that the center of gravity of the golf club head becomes low.

25 [0018]

In a hollow golf club head comprising a face portion, a sole portion, a side portion and a crown portion bending upwardly, the golf club head of the invention (claim 4) is characterized in that the golf club head is formed of three  
5 bodies, that is: a front body, which includes a face portion and forms a front part of the head; a back body forming a rear part of the head; and a middle body disposed between the front body and the back body, the middle body extending at least from the crown portion to a toe side of the side portion and to a  
10 heel side of the side portion, and that material of the middle body is thinner than those of the front body and the back body.  
[0019]

In this golf club head, not only the crown portion but also the side portion on the toe side and the heel side are  
15 so thin that the golf club head is also light in weight. In addition, the crown portion bends sufficiently at the time of impact so that the launch angle of a ball can be increased. As a result, even when a golfer having a low head speed uses the golf club head, the launch angle becomes so high that the  
20 carry can be increased. In addition, the moment of inertia is so high that the sweet area can be expanded.

[0020]

In the golf club head of the invention (claim 4), the sole portion and the side portion of the back portion may be  
25 thick in a range of 1.2 mm to 4.0 mm. In such a manner, the

center of gravity of the golf club head can be made low, or the depth of the center of gravity can be increased.

[0021]

When the middle body is not disposed in the sole portion  
5 in the gold club head according to the invention, the center of gravity of the golf club head becomes so low that a ball (hit ball) becomes easy to rise.

[0022]

In the invention, the middle body may be present only  
10 in the crown portion and the side portions, and furthermore may be present in the sole portion. When the middle body includes at least part of the crown portion, at least part of a sole portion, and at least part of the side portion. When the middle body includes at least part of the crown portion and at least  
15 part of the side portion, it is preferable that a ratio of an area of the middle body to an entire outer surface area of the golf club head is in a range of 5 % to 30 %. When the middle body includes at least part of the crown portion, at least part of a sole portion, and at least part of the side portion, it  
20 is preferable that a ratio of an area of the middle body to an entire outer surface area of the golf club head is in a range of 8 % to 35 %.

[0023]

In the invention, it is preferable that the middle body  
25 includes the highest (top) point of the crown portion. The

middle body may have a slit-like shape 10-20 mm wide.

[0024]

[Embodiments of the Invention]

Embodiments will be described below with reference to  
5 the drawings. Figs. 1(a), 1(b) and 1(c) are a perspective view,  
a side view and a sectional view of a golf club head according  
to an embodiment.

[0025]

A golf club head 1A includes a face portion 2, a crown  
10 portion 3, a sole portion 4, a side portion 5 and a hosel portion  
6. The golf club head 1A is formed out of a front body 10,  
a middle body 11 and a back body 12 integrated with one another.

[0026]

The front body 10 forms the front portion of the golf  
15 club head 10 and includes the face portion 2, a crown portion  
front edge, a side portion front edge and a sole portion front  
edge, which are connected to the face portion 2, and the hosel  
portion 6. The face portion 2 is provided with scorelines  
(grooves) in accordance with necessity.

20 [0027]

The back body 12 forms the rear portion of the golf club  
head and includes a rear edge of the crown portion 3, opposite  
side surfaces (heel-side and toe-side side surfaces) of the  
rear portion of the side portion, a back surface of the side  
25 portion, and a rear edge of the sole portion.

[0028]

The middle body 11 is located between the front body 10 and the back body 12. The middle body 11 is provided with a middle crown 11a forming the front/rear-direction intermediate portion of the crown portion 3, a middle side 11b forming the front/rear-direction intermediate portions of the toe-side and heel-side side surfaces of the side portion 5, and a middle sole 11c forming the front/rear-direction intermediate portion of the sole portion 4. The middle body 11 has an annular shape surrounding the golf club head in the toe-heel direction.

[0029]

In this embodiment, the middle body 11 is made from an aluminum alloy while each of the front body 10 and the back body 12 is made from a titanium alloy. It is preferable that the average thickness of the middle body 11 is 60-100%, particularly about 80-90% of the average thickness of the crown portion and the side portion in the front body 11 and the back body 12.

[0030]

The front body 10 and the back body 12 are preferably produced by forging or casting in advance. More preferably each body 10, 12 is a forging. The melting point of a titanium alloy or stainless steel is about 1,400-1,600°C while the melting point of an aluminum alloy or a magnesium alloy is low to be about 600-700°C. It is therefore a casting is preferable.

[0031]

To manufacture the golf club head 1A, a core for casting the middle body is disposed between the front body 10 and the back body 12, which are produced in advance and disposed in a mold. Aluminum alloy liquid is charged into the mold to form the middle body 11 and integrate the middle body 11 with the front body 10 and the back body 12. After release from the mold, deflashing and plating or painting are performed in accordance with necessity so as to form a golf club head.

10 [0032]

Incidentally, in the crown portion 3 and the side portion 5 according to this embodiment, the middle crown 11a and the middle side 11b of the middle body 11 are formed to be one step lower than the crown portion and the side portion in the front body 10 and the back body 12 so that step surfaces are formed in the crown portion 3 and the side portion 5. With such a configuration, the seam between the middle body 11 and the front body 10 formed out of different kinds of raw materials and the seam between the middle body 11 and the back body 12 formed likewise are located in the step portions, respectively. Thus, the sense of discontinuity or mismatch in appearance caused on the seams by the difference in raw material is relieved. Incidentally, the color in appearance may be made to differ between the middle body 11 and the front body 10 and between the middle body 11 and the back body 12.



[0033]

In the sole portion 4, the front body 11, the middle body 12 and the back body 12 are flush with one another. However, the middle body 11 may be made one step lower in the same manner as the crown portion 3 and the side portion 5.

[0034]

In this embodiment, the width of the middle body 11 in the front/rear direction of the head is substantially uniform among the crown portion 3, the side portion 5 and the sole portion 4. However, the width may have a variation. Incidentally, it is preferable that the maximum width of the middle body 11 in the front/rear direction in the sole portion 4 is 10-50 mm, particularly 15-30 mm.

[0035]

It is preferable that the external surface of the middle body 11 occupies 5-30%, particularly 8-25% of the whole external surface area of the golf club head 1A. In the crown portion 3, the middle body 11 preferably has a width of 10-50 mm of the maximum width of the golf club head, particularly 15-30 mm.

[0036]

In the golf club head configured thus, the middle body 11 made from a low-specific-gravity aluminum alloy is disposed between the front body 10 and the back body 12 each made from a titanium alloy. The whole volume of the golf club head is

larger than that of a golf club head having the same weight but wholly produced out of a titanium alloy with a uniform thickness. Accordingly, in comparison with a related-art golf club head having the same weight, the moment of inertia is  
5 increased so that the sweet area can be expanded.

[0037]

In addition, in this golf club head, the longitudinal elastic modulus of the aluminum-alloy middle body 12 occupying the front/rear-direction intermediate portion of the crown  
10 portion is lower than that of the front body 11 and the back body 13 each made from a titanium alloy. Accordingly, the crown portion 3 bends largely at the time of impact so that the launch angle of a ball is high. Thus, even when a golfer having a low head speed uses the golf club head, a long carry can be  
15 obtained.

[0038]

Incidentally, when the differences in longitudinal elastic modulus between the middle body and the front body and between the middle body and the back body are not smaller than  
20 1,000 kgf/mm<sup>2</sup> ( $9.8 \times 10^9$  Pa), particularly not smaller than 1,500 kgf/mm<sup>2</sup> ( $14.7 \times 10^9$  Pa), the crown portion is bent more easily so that a longer carry can be obtained. Incidentally, when the differences in longitudinal elastic modulus between the middle body and the front body and between the middle body and  
25 the back body are too large, the launch angle is indeed high,

but the repulsive force of a ball when the ball is hit is reduced so that the carry is reduced. It is therefore usually preferable that the differences are not larger than  $3,000 \text{ kgf/mm}^2$  ( $29.4 \times 10^9 \text{ Pa}$ ), particularly not larger than  $2,600 \text{ kgf/mm}^2$  ( $24.5 \times 10^9 \text{ Pa}$ ).

5 [0039]

In the embodiment, the middle body 11 is made from an aluminum alloy. However, the middle body 11 may be made from a titanium alloy thinner than the front body 10 and the back body 12 in the crown portion (preferably 80-100%, particularly 10 90-95% as thick as the front body 10 and the back body 12). Differently from the aluminum-alloy middle body, the thin titanium-alloy middle body can be bonded by welding to the front body and the back body because the melting point is close to those of the front body and the back body. The middle body 15 maybe integrated with the front body and the back body by casting. Alternatively, the middle body may be produced separately and then integrated with the front body and back body by welding such as laser welding or plasma welding. Laser welding or plasma welding is suitable for thin metal because deformation caused 20 by welding is low.

[0040]

Alternatively, the middle body 11 may be made from fiber reinforced synthetic resin such as carbon fiber reinforced plastics (CFRP).

25 [0041]

To produce a golf club head including the middle body 11 made from fiber reinforced synthetic resin, the front body 10 and the back body 12 produced in advance are disposed in a forming mold. In addition, an internal pressure rubber bag 5 whose outer circumference is surrounded by prepreg of fiber reinforced synthetic resin is disposed in the mold. Gas such as air is supplied to the internal pressure rubber bag so as to inflate the internal pressure rubber bag. Thus, the prepreg is brought into close contact with the inner surface of the 10 mold and the inner surface edge portions of the front body and the back body. Next, the prepreg is heated and cured. Also in such a manner, the golf club head can be produced. In the front body, it is preferable that the crown portion and the side portion are made to have substantially one and the same 15 thickness, while the face portion is 2-3 mm thick, and thicker than the crown portion.

[0042]

A golf club head 1B according to another embodiment will be described with reference to Fig. 2.

20 [0043]

This golf club head 1B includes a front body 20, a middle body 21 and a back body 22. The front body 20 and the back body 22 are coupled with each other continuously and integrally in the sole portion 4.

25 [0044]

The middle body 21 is located in the front/rear-direction intermediate portion of the crown portion 3 and in the front/rear-direction intermediate portion of the side portion 5. In the crown portion 3, the middle body 21 includes of a middle crown 21 having a substantially uniform width in the toe/heel direction. In the side portion 5 on each of the toe-side and the heel-side, the middle body 21 includes a substantially inverted-triangular middle side 21b whose width is reduced as approaching its bottom. Although the middle side 21b reaches the sole portion 4 in this embodiment, the middle side 21b may be at a slight distance (for example, about 5-15 mm) from the sole portion 4.

[0045]

It is desired that the constituent materials of the golf club head and the thickness and manufacturing method of each part of the golf club head are similar to those in the embodiment in Fig. 1. Incidentally, it is preferable that the average front/rear-direction width of the middle crown 21a is 10-50 mm of the maximum width of the golf club head 1B, particularly 15-30 mm.

[0046]

In this embodiment, it is preferable that the area of the external surface of the middle body 21 is 5-30% of the whole external surface area of the golf club head 1B, particularly 8-25%.

[0047]

Also by the golf club head 1B according to this embodiment, operation and effect similar to those of the golf club head 1A can be obtained. Incidentally, the front body 20 and the back body 22 are integrated with each other in this embodiment. Thus, it is easy to manufacture the golf club head. In addition, the center of gravity is lower than that in the golf club head 1A. Thus, a ball (hit ball) is easy to rise.

[0048]

Next, description will be made on metal materials forming the golf club head.

[0049]

As the titanium alloy when the middle body 11, 21 is made from the titanium alloy, and as the titanium alloy for forming the back body 12, 22, a  $\beta$  type titanium alloy whose longitudinal elastic modulus is not higher than  $10,500 \text{ kgf/mm}^2$  ( $102.9 \times 10^9 \text{ Pa}$ ) is preferable. Examples of such titanium alloys include Ti-15V-3Cr-3Sn-3Al, Ti-13V-11Cr-3Al, Ti-15Mo-5Zr, Ti-15Mo-5Zr-3Al, Ti-3Al-8V-6Cr-4Mo-4Zr, and Ti-22V-4Al.

[0050]

As for the front body 10, 20, either the  $\beta$  type titanium alloy described above or an  $\alpha$ - $\beta$  type titanium alloy which will be described below may be used.

[0051]

As for the back body 12, 22,  $\alpha$ - $\beta$  type titanium alloys

such as Ti-6Al-4V and Ti-6Al-6V-2Sn and a near  $\alpha$  type titanium alloy such as Ti-8Al-1Mo-1V, which have longitudinal elastic modulus not lower than 11,000 kgf/mm<sup>2</sup> ( $107.8 \times 10^9$  Pa) may be used. In addition, Ti-3Al-8V-6Cr-4Mo-4Zr and Ti-22V-4Al, which are

5  $\beta$  type titanium alloys heat-treated to have a longitudinal elastic modulus within the aforementioned range, can be also used.

[0052]

Generally, the longitudinal elastic modulus of a  $\beta$  type

10 titanium alloy varies in accordance with a difference in a heat treatment mode. The following Table 1 shows treatment modes and longitudinal elastic moduli of various titanium alloys and pure titanium and longitudinal elastic moduli of the titanium and the titanium alloys.

15 [0053]

[Table 1]

crystal structure	titanium alloy	longitudinal elastic modulus (kg/mm <sup>2</sup> )	purpose	Preferred applicable part
$\beta$	Ti-15V-3Cr-3Sn-3Al	10,200-10,500	forging	crown member
$\beta$	Ti-13V-11Cr-3Al	8,400-10,500	forging	crown member
$\beta$	Ti-15Mo-5Zr	7,800-12,000	forging	crown member
$\beta$	Ti-15Mo-5Zr-3Al	8,000-12,000	forging	crown member
$\beta$	Ti-3Al-8V-6Cr-4Mo-4Zr	10,700-12,600	forging	crown member
$\beta$	Ti-22V-4Al	8,900-11,000	forging	crown member
$\alpha$ - $\beta$	Ti-6Al-4V	11,500	forging/casting	sole member
$\alpha$ - $\beta$	Ti-6Al-6V-2Sn	11,300	casting	sole member
near $\alpha$	Ti-8Al-1Mo-1V	12,700	forging	sole member
	pure titanium	10,850	cutting/forging/casting	hosel member
$\alpha$ - $\beta$	Ti-3Al-2V (+S+rare earth)	10,900	cutting/forging/casting	hosel member



[0054]

Incidentally, in the heat treatment of the  $\beta$  type titanium alloy, it is preferable that age-hardening treatment is not performed on the material used for the top plate. Thus, the  
5 elastic modulate of the material is kept low. Also as for the headbody 10, a  $\beta$  type titanium alloy subjected to age-hardening treatment may be used.

[0055]

Next, description will be made on preferred dimensions  
10 of the golf club head.

[0056]

The invention is applied particularly effectively to a large-size golf club head whose crown portion is bent easily, and whose head volume is specifically not smaller than 250 cc,  
15 preferably not smaller than 300 cc, more preferably not smaller than 350 cc. Generally, the larger the volume of a golf club head is, the larger the weight of the golf club head is. When the weight is too large, it is difficult to swing a golf club with the golf club head smoothly. From the point of view of  
20 this restriction to weight, it can be therefore considered that the head volume has an upper limit of about 600 cc. The invention is preferably suitable for application to a driver head whose loft angle is 7°-15°.

[0057]

25 It is preferable that the face height of the golf club

head is higher. The higher the face height is, the larger the loft angle is when a ball is hit with an upper portion of the face surface. Specifically, it is preferable that the face maximum height is not smaller than 45 mm, particularly not  
5 smaller than 50 mm, more particularly not smaller than 53 mm. However, it is not preferable that the face height reaches 100 mm or more. In such a case, the wind pressure resistance of the face surface during a swing increases excessively.

[0058]

10 When the golf club head is used as a driver head, the club length is typically about 43-50 inches. In consideration of swing balance, it is preferable that the head weight is about 165-205 g. When the head is too heavy, a general golfer is out of balance during a swing so that the golfer cannot take  
15 a full swing. When the head is too light, the repulsion of a ball may deteriorate.

[0059]

[Advantage of the Invention]

As described above, according to the golf club head of  
20 the invention, the moment of inertia is so high that the sweet area is wide, and even when a golfer having a low head speed uses the golf club head, the launch angle becomes so high that the carry can be increased.

[Brief Description of the Drawings]

25 [Fig. 1]

(a) is a perspective view of a golf club head according to an embodiment of the invention, (b) is a side view thereof, and (c) is a sectional view thereof.

[Fig. 2]

5 (a) is a perspective view of a golf club head according to another embodiment of the invention, (b) is a side view thereof, and (c) is a sectional view thereof.

[Fig. 3]

a perspective view of a related art golf club head.

10 [Description of Reference Signs]

1, 1A, 1B golf club head

2 face portion

3 crown portion

4 sole portion

15 5 side portion

6 hosel portion

10, 20 front body

11, 21 middle body

12, 22 back body

20

[Name of Document] Abstract

[Abstract]

[Object] To provide a golf club head having a large inertia moment and a wide sweet spot, the golf club head, which can  
5 provide large launch angle and long carry even if a golfer who has a low head speed uses it.

[Solving Means] A golf club head 1A is one in which a front body 10, a middle body 11 and a back body 12 are integrated. The middle body 11 is disposed between the front body 10 and  
10 the back body 12. The middle body 11 is provided with a middle crown 11a forming the front/rear-direction intermediate portion of the crown portion 3, a middle side 11b forming the front/rear-direction intermediate portions of the toe-side and heel-side side surfaces of the side portion 5, and a middle  
15 sole 11c forming the front/rear-direction intermediate portion of the sole portion 4. The middle body 11 is made of aluminum alloy, and the front body 10 and the back body 12 are made of titanium alloy.

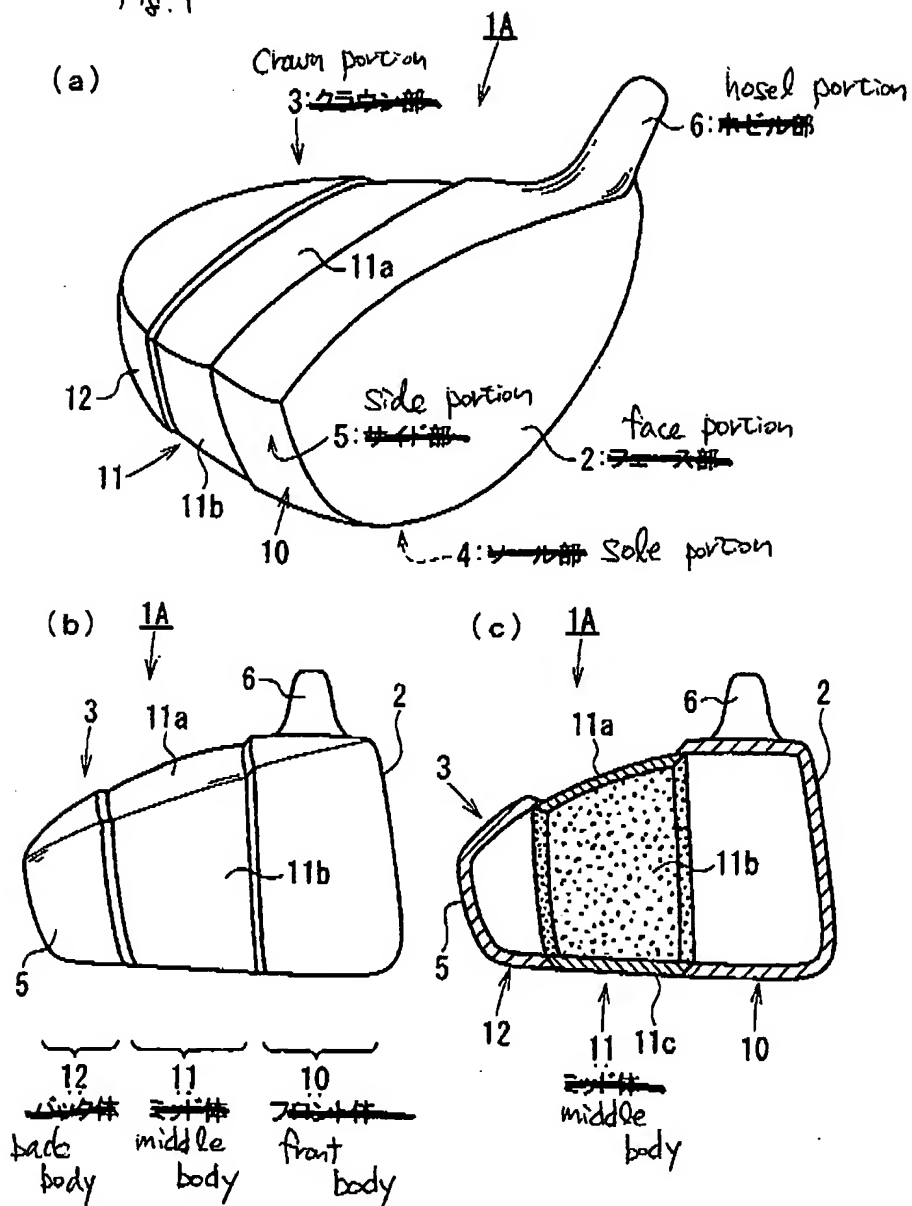
特願2003-020670

ページ: 1/

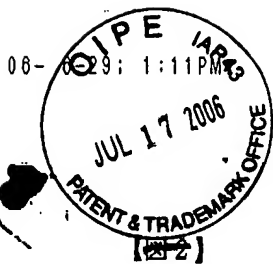
Name of Document  
 【書類名】 図面 Drawings

【図1】

Fig. 1



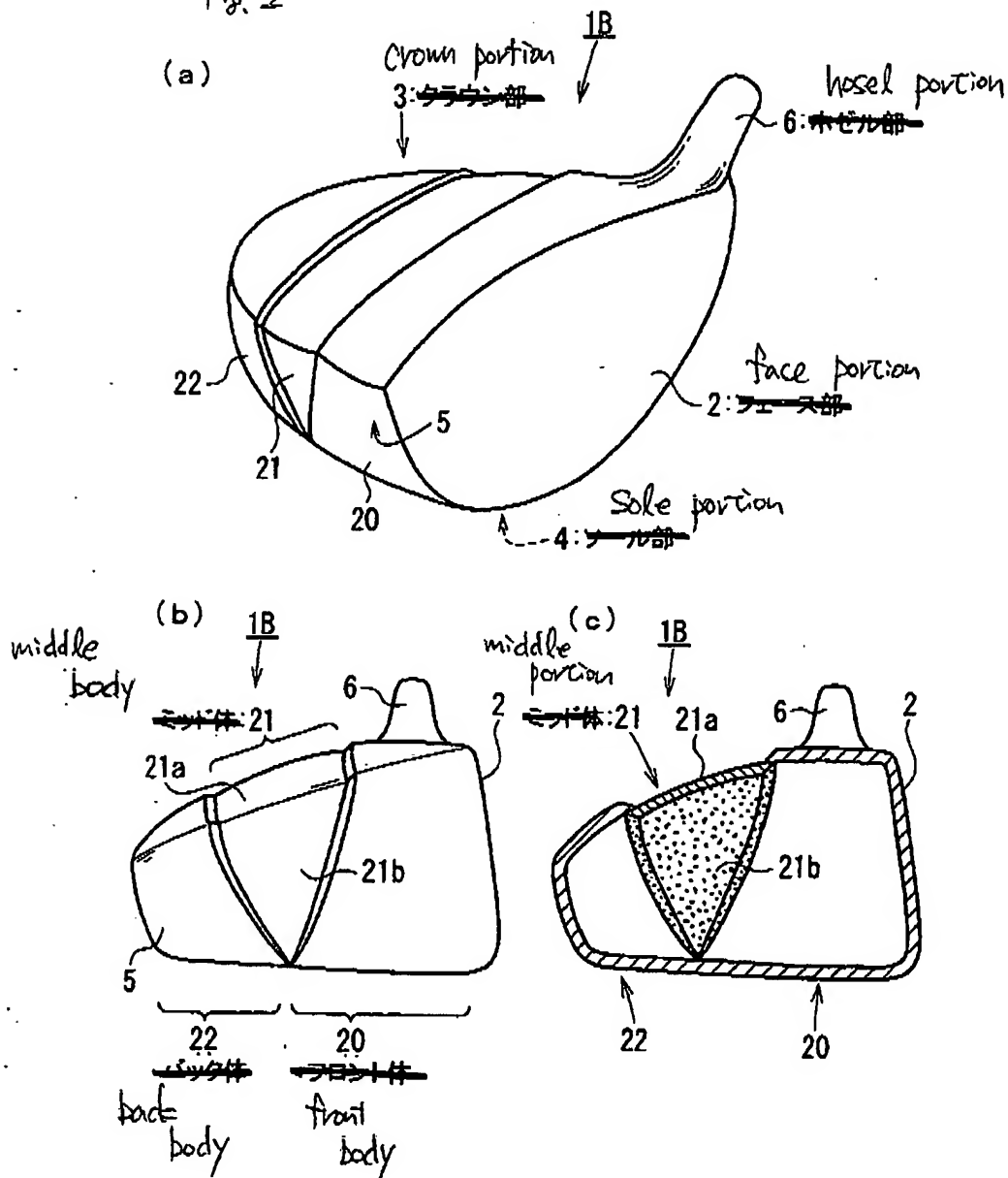
出証特2004-3007471



特願 2003-020670

ページ: 2/

Fig. 2



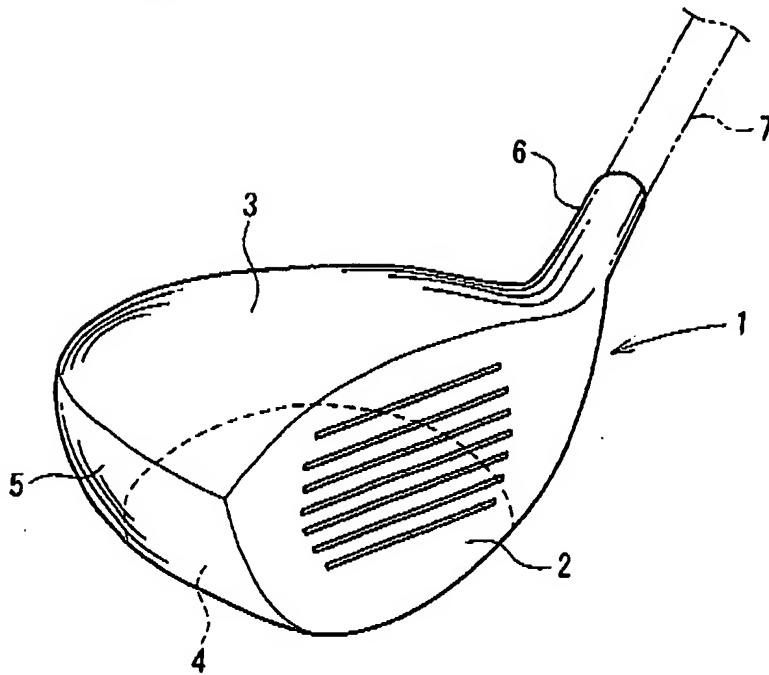
出証特 2004-3007471

特願2003-020670

ページ: 3/E

【図3】

Fig. 3



出証特2004-3007471